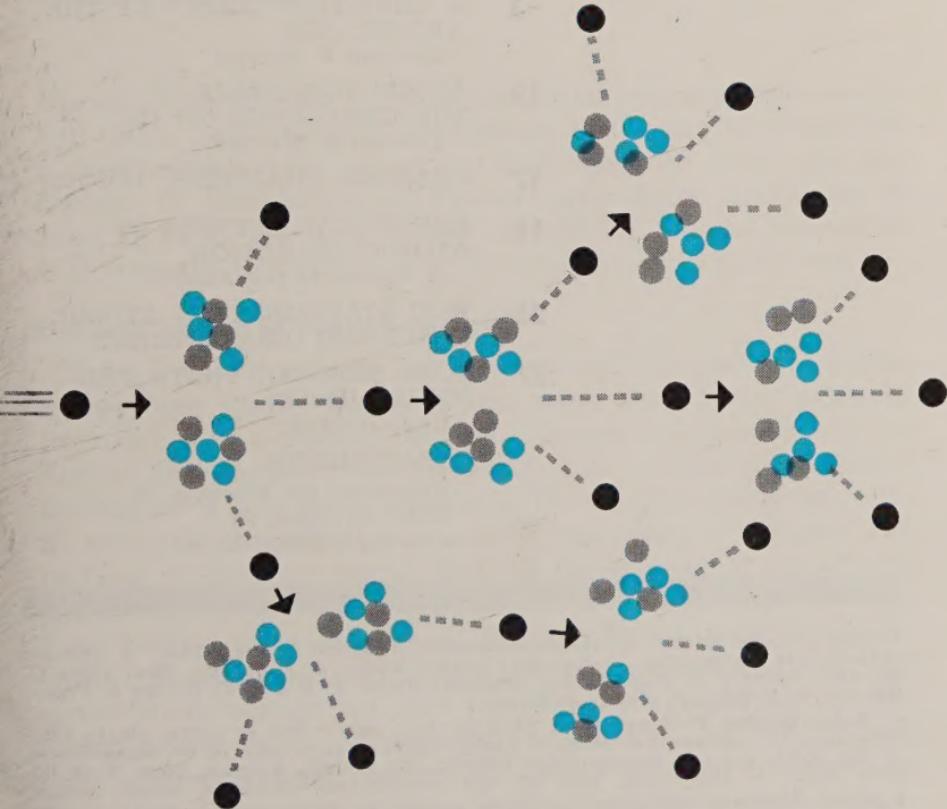




atomic energy: peril and promise

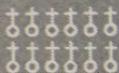


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SOCIAL ACTION

October 1957

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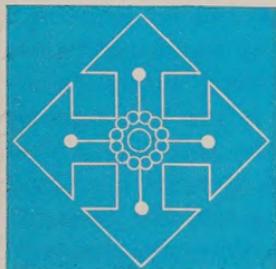
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a Christian looks at the atomic age

The age of atomic energy, in its industrial and economic aspects, will likely bear no more resemblance to the age of steam than a jet-powered plane to an old-fashioned box kite." So said Dwight D. Eisenhower at Pennsylvania State University on June 11, 1955. Thinking of the "A" and "H" bombs, most of us will almost automatically add, "if civilized society survives!"

Dynamic power of nuclear energy

Taking a long look at "the promise and the peril" of atomic energy, one hardly knows which poses the greater problem. Promise? Wait a minute! Newton I. Steers, Jr., President of the Atomic Development Mutual Fund, Inc., spells out President Eisenhower's "box kite" statement. The coming atomic age, with its revolutionary effects in medicine, in travel, in industry, can be made to look wonderful. But the Department of the Church and Economic Life of the National Council of Churches has done well to warn us that all this presents a vast new challenge. "Every community," says a Department memo, "as well as the whole society will feel the changes wrought by the dynamic growth of the nuclear energy industry." So! We are now to have some dynamic growth! As if there were not already more dynamism and growth, at least in the American sector of Western society than we know how to handle! The new human and ethical problems of the Atomic Age make the breath come faster. Promise? Perhaps.

By Herman F. Reissig, International Relations Secretary,
Council for Christian Social Action, United Church of Christ.

There is also peril in the peaceful uses of atomic energy, quite apart from the bombs and their fall-out. Man has let loose into our world something of a different order from anything he has ever before had to deal with. It may be too much for his intellectual and spiritual resources. At any rate, let no one suppose that if only we would stop testing the bombs and insure that they never would be used in war, we could then sit back and be inwardly comfortable again. The bombs aside, the now released energy of the atom is something so incommensurate with previous human experience and so nearly immeasurable in physical power that only a parable seems faintly adequate to describe it. It is like a group of men chasing a huge herd of wild horses, with the intention of taming them. But the chase has become confused, and it is not certain whether the men are chasing the horses or the horses chasing the men.

"The total energy contained in one pound of uranium is potentially equal to the energy from 1,300 tons of coal burned to produce steam," says a pamphlet published by the U. S. Department of State. That gives a hint of what's ahead, suggesting a whole series of social problems created by a profoundly changed industrial mechanism. But consider another aspect of this promise—peril, as described by the National Academy of Sciences:

The atomic energy program will soon present an unparalleled problem in storage. To keep our general surroundings habitable, enormous quantities of waste products from nuclear fission will have to be tightly contained for very long times.¹

No victors in an atomic war

Fall-out from bomb testing and the effects of actual atomic bombing in war are another matter. So immeasurably horrible would be the use of the bomb in war that most sane minds reject the thought altogether. In Operation Alert, a recent rehearsal staged by Civilian Defense, the estimated casualty toll in New York City rose to 4,429,729 dead and 1,932,369 injured!² No wonder the general public is disinclined to take these rehearsals seriously! Some five years ago an American theologian, noted for his "realism," said something most of us can appreciate. When the group discussion went on from a consideration of the

¹ *The Biological Effects of Atomic Radiation, A Report to the Public*, National Academy of Sciences—National Research Council, Washington, D. C., 1956.

² *New York Times*, July 14, 1957.

deterrant effect of possessing the "H" bomb to its actual use on cities, the theologian refused to think about it. "I'd rather," he said, "be dead." If four or five million people in just one city are to be blasted and burned, who wants to live on in that "dark chamber of horrors"?

We should take with utmost seriousness the solemn words spoken by the President of the United States at his press conference, June 25, 1957: "I have told you time and time again—I repeat it almost in my sleep—there will be no such thing as a

*To call the H-bomb clean
Makes sound and sense divergent
Unless it's meant to mean
The Ultimate Detergent.*

—*Punch, LONDON*

victorious side in any global war of the future." Mr. Khrushchev knows it, too. He said it in the TV interview broadcast in the United States: "If any man, whom I would call a mad man, should unleash war . . . it would be a great calamity for the world." A little farther on I shall have more to say about what might be called bombs as deterrents vs. bomb use. Here let us only assert that, whatever may be claimed for the bombs in the prevention of war, no one—but *no one*—has a moral right to engage in all-out atomic war.

Various estimates of the danger of fall-out

Scientists are agreed that fall-out from bomb testing is a dangerous business. They are, however, not agreed on the degree of danger now and in the immediate future. They freely confess that they do not know what amount of radiation is "tolerable." Nor are they sure about the degree of radiation that human beings now receive—counting the "background" radiation (about which we can do nothing, since it comes up from the earth and down from the sky), the average number of roentgens we receive in medical and dental treatments, and the radiation from the fall-out from bomb testing. With one voice they say, "There is no 'safe,' that is, genetically ineffective, rate of radiation."³

³ Bentley Glass, "The Hazards of Atomic Radiations to Man—British and American Reports," *Bulletin of Atomic Scientists*, Vol. XII, No. 8, October, 1956.

Said Albert Schweitzer, in his now famous radio broadcast on this subject:

We are forced to regard every increase in the existing danger through further creation of radioactive elements by atom bomb explosion as a catastrophe for the human race, a catastrophe that must be prevented.

Having read articles on the current debate by many scientists, I would venture the guess that, while some of the best of them (best, both as scientists and as people who have a deep concern for the welfare of all human beings) are not now ready to say that *any* "increase in the existing danger" must be regarded as a "catastrophe," they, nevertheless, are apprehensive enough about any increase to make them glad Schweitzer said what he did. For example, an editorial in the *Bulletin of the Atomic Scientists* declares: "An appeal such as Dr. Schweitzer's cannot be dismissed merely because it makes use of some unverified or exaggerated descriptions of the radiation hazard."⁴

Significantly almost the sole scientist who has taken public issue with Dr. Schweitzer is Dr. Willard F. Libby. Dr. Libby is, as everyone seems to agree, one of our ablest physical scientists. No one, so far as I can discover, has questioned his scientific competence or his integrity. It is not, however, without interest in this connection that Dr. Libby is one of the members of the United States Atomic Energy Commission. Apparently he has been appointed chief spokesman for the Commission in the debate about danger from fall-out.

Role of the AEC

The Atomic Energy Commission carries responsibility for the development of atomic weapons and, also, for the protection of public health against the hazards of such development. That the thinking of human beings is subject to distortion by their main personal interests is nicely illustrated in the circumstance that a group of men whose *chief* function is the development of more effective weapons consistently underplays the hazards. "An all-powerful government agency," says Max Ascoli, editor of *The Reporter*, "too frequently is tempted to use the cloak of secrecy to shield the ignorance rather than the knowledge of men in the

⁴ Vol. XIII, No. 6, June, 1957.

know." Lest we be tempted to hurl self-righteous condemnation at the men of the AEC, let us ponder also what Ascoli says in the next paragraph:

Yet once more we should be compassionate in passing judgment on the behavior of the men working for the AEC, from the highest

to the lowest. The cloak of secrecy which they wear must be excruciatingly heavy, for it imposes on these unfortunate men—particularly those at the top—too great a burden of certainty and of doubt. Perhaps no one who has had the secret of the atom entrusted to him

by his own genius or by chance of official appointment has escaped being, somehow, marked for life.⁵

Impact of scientific discoveries on Christianity

The foregoing paragraphs have briefly delineated the principal aspects of the subject: the possibilities and dangers of peaceful uses of atomic energy, the use of the bombs in a future war, the danger to contemporary and future human beings of bomb-produced radiation, and, finally, the role of the Atomic Energy Commission. What, now, shall Christians think—and do?

We might recall the experience of Christians with previous great scientific discoveries. When Galileo challenged Copernican astronomy with his assertion that the earth is not a stationary but a moving planet, it seemed to many that faith in God was finished. So, in the name of God, Galileo was compelled to take it all back.

Later, scientists revealed a fact just as hard for faith to digest. Not only did the earth move; but it was one of the smallest planets in a vast universe. The old picture of God in "heaven above" occupying himself with the affairs of men subsisting on the "epidermis of one of the minor planets" began to look like something for children to believe. Still later, Darwin and the doctrine of evolution seemed to relegate the conception of divine creation to the realm of childish fantasy. After each cardinal scientific discovery a period of dismay and spiritual trembling!

⁵ *The Reporter*, May 16, 1957.

God abideth still

With the passing of time, men and women learned what an Old Testament writer had discovered long before. The earlier Biblical writings depict God as appearing to his people mainly in dreams. It was a new and great revelation when a man discovered, what he later wrote down: "When I awake, I am still with thee."⁶ Time after time, frightened by astounding new facts, men have wished to close their eyes against them, only to discover that when they opened their eyes God was still there.

Concerned, as we should be, about the new range of power at our disposal, let us think about it and deal with it as those who know that men and their world are still in the hands of him who brought them forth. "Therefore, will not we fear, though the earth do change."

Christian faith will deal with atomic-energy-remaking-our-daily-lives as it must deal with every access of power and every change in the external environment. It will hurt or help us, depending upon our alertness and the degree of our resolution that it must be made to serve men as spiritual beings. Jacob was not the last to wrestle with a dark angel. "I will not let you go, unless you bless me."⁷ That, and not any moaning protest against the new fact, is the Christian spirit.

Christian responsibility for atomic energy

To make the new energy help, and not hurt, us is a task not only for scientists. They will have a central responsibility. And we may be grateful that so many of them have turned from the old "science for science's sake" attitude to the acceptance of social responsibility. Christians need not fight against the scientists; they can work with them toward the mastery of nuclear power. This is a new and imperative field for Christian social action.

Will the atomic energy installation in your community have adequate safeguards against damage to life? Is the power being made available so great that far more public (government) control is required than in the case of other industries? Will

⁶ *Psalm 139:18.*

⁷ *Genesis 32:26.*

the law carry indemnity provisions commensurate with the risks of the new industry? Will the government and people of the United States keep the needs of the under-developed and "power-starved" areas in the forefront of their thinking? These are some of the questions Christians should think about as, with faith and resolution, they move into the atomic age.

Christians say "No" to atomic war

On the use of the atomic, hydrogen, and cobalt bombs in war I have already expressed my conviction. Quite apart from the question of who wins the war (President Eisenhower says no one would win), it is impossible for this Christian to find moral justification for dropping the bombs on any city anywhere. As a non-pacifist Christian, I could imagine a situation in which the use of one cobalt bomb might possibly be justified. If, let us say, two million people were clearly bent on destroying the rest of the human race and had the power to do so, and if these two million comprised the population of one city, we would, I think, be justified in destroying these people. This would be a simple and clear case of self-defense. But, obviously, no such situation could ever exist.

Until quite recently our political and military leaders were in the habit of saying: "We must have enough military power to discourage aggression and to win if war should be forced upon us." Responsible leaders do not talk like that now. As realists, they cannot imagine a true victory in an atomic war. In addition, the elemental moral sense, common to all sane men, rejects the visualization of what the bombs would do.

Whether or not our military leaders are invariably saying "No!" to the use of bombs, Christians ought to say it. And with one voice! The security of the United States is a very precious thing. But the Christian conscience should not dare attempt to protect that security at the price of the atomized cities of another nation—*even if we could prevent the same thing happening to our country*. Such a statement will seem to some pacifists an argument against our having participated in past wars. Well, what sensitive Christian who felt his country must fight in World Wars I and II did not suffer agony of spirit and ask divine forgiveness for the evil we felt compelled to do, lest a greater evil befall us?

But a war with atomic bombs is something else again! And the choice would not fall between lesser and greater evil but between evil (assuming the enemy were modern communism or something worse) and the almost absolute evil of raining the bombs on great cities. If many of us have a guilty conscience about Hiroshima, what would be the state of our minds after many Hiroshimas, far more thoroughly blasted and burned? The Central Committee of the World Council of Churches, meeting in New Haven, Connecticut, last August, did not mince words on this matter. Said the leaders of 165 Protestant and Eastern Orthodox bodies: "We believe that the use of such methods of warfare inevitably involves spiritual degradation for any nation that uses them."⁸

Yet the terribly sobering probability is that, if in the near future the large nations should blunder into war (none of the chief powers would now deliberately provoke a major war) they would end, if not begin, with their most terrible weapons. This means that the only safe thing to do with the bombs is, first, to stop making and testing new ones and, then, ultimately to destroy the stockpiles. For, if only a government gone mad would start an atomic war, it seems almost certain that any nation possessing the bombs would use them if its national survival seemed to be at stake.

Bombs as a deterrent to war

Such an argument would not until recently have been valid. Many people, among them able Christian thinkers, believe that atomic and hydrogen bombs in the arsenals of the United States have, since 1945, been a principal, if not the principal, reason for the fact that World War III has not occurred. If the bombs are never used, who can say that their invention was not, in the providence of God, a potential evil that had a good result? The Soviet Union means business in its struggle for predominant world power. No Christian should have any doubt about that! It is significant that the World Council of Churches, which now denounces every use of the bombs and also asks that the tests be stopped, had not, until last August, been ready to give such counsel. The world situation has changed. The "balance of terror" has given governments sober second thoughts. The free

⁸ See the full statement on pp. 25 and 26 of this issue.

world has demonstrated its alertness and its strength. While we may be certain that the Soviet Union is not reconciled to its present power status, much less to its abatement, there is now less probability that it will seek to extend its power by war.

The end of bomb testing and the destruction of our stockpiles need not occur simultaneously. At the risk of venturing into fields where one who is neither scientist nor military man has no competence, it would seem that if the deterrent effect of bomb possession is still needed we have enough bombs for the purpose. If the world knows that the United States has bombs powerful enough and numerous enough to destroy, let us say, fifty twenty-mile areas, will the possible aggressor be inclined to risk war because *he* has bombs that can destroy sixty such areas?

Reduce the power of the AEC

Which brings us to our final point. I suggest, as a moral and ethical comment on this subject, that the United States Atomic Energy Commission has more power than ought to be placed in the hands of a small group of men. The commissioners may be men of the highest technical competence and moral integrity. They are still fallible human beings, men whose moral judgment—and scientific judgment, too—can be twisted by personal pride and by their responsibility for building more effective weapons of war.

Who decides that the inhabitants of Nevada shall run a special risk from fall-out? The Atomic Energy Commission. Who decides that the people of Japan shall be subjected to special risks? The Atomic Energy Commission. Who decides that, despite the warnings of scores of the most eminent scientists and pleas from the public, the tests will go on? The Atomic Energy Commission. To be sure, the President must concur in major decisions. But so great an aura of authority now surrounds the Commission, and so technical are many aspects of its work that, even if its power does have legal limits, we would better look at it, as one scientist said of the fall-out, "with a jaundiced eye." Even without the bombs, we in the United States have had our full share of "top-secret" in the name of security. It is not good that we should set up a little group of men with such power in matters that radically affect our physical well-being and spiritual health.

By Thomas E. Murray, a member of the Atomic Energy Commission 1950-'57; now Consultant to the Joint Committee on Atomic Energy of the U. S. Congress.

atoms for peace:

If men consent to act reasonably (it is a big "if"), atomic energy can powerfully assist in creating certain conditions in the world which men commonly acknowledge to be at least the earthly conditions of human welfare; for instance, the advancement of man's understanding of nature, the improvement of human health, and the provision of a decent standard of living on a world-wide scale. These are authentically human purposes sanctioned by the high imperatives of the moral order. There are two chief areas in which peaceful uses of atomic energy can further them.

Use of radioactive isotopes

First, there is the large, and rapidly expanding, area in which uses are being found for radioactive isotopes. These by-products of atomic processes can be applied to many purposes in medicine, genetics, technology and agriculture. They are useful in the diagnosis and treatment of certain diseases, including cancer; they provide a sure and rapid way of testing industrial materials; they can serve in the production of new plants through genetic mutations. Perhaps their most important use so far has been as "tracer elements." By adding a small amount of radioactive isotope to a given element it is possible to follow the fate of this element in chemical reactions, and even in living organisms, by observing the radiation emitted. The use of this method has already marked a new epoch in our understanding of the processes of nature. . . .

Use as a source of power

The second great area in which atomic energy can make an incalculable contribution to human betterment . . . [is] the use

¹ Reprinted by permission of *The New York Times*

the challenge to us



of nuclear energy to generate industrial power. It is in this area that the famous phrase, "atoms for peace," can acquire its full meaning. The use of radioactive isotopes is a splendid opportunity; the use of atomic energy for industrial power is an urgent need.

Two recent developments emphasize the urgency of the need. The first was the formation of EURATOM, the European Atomic Energy Community, composed of six nations. The second was the constitution of the International Atomic Energy Agency, the work of eighty nations. These two new institutions have a common premise: . . . a new source of energy, other than conventional fuels, is needed with a critical urgency. . . .

Less than one-third of mankind presently enjoys the material advantages [of civilization]. . . . There no longer exists a society which does not wish to partake of the material benefits which industrial development sets within the reach of the general population. Men everywhere now realize that it is no longer necessary to live in wretchedness. They are determined to lift themselves out of the subnormal conditions which have hitherto been their lot. The achievement of the industrialized way of life has become a fundamental imperative for practically the whole world. . . .

The key to success is industrial power. Providentially, we have the key in our hands—atomic energy. If we exploit its possibilities with energy and foresight, we can avoid the explosive situation that wide economic inequalities in the world will increasingly intensify. More importantly, we shall seize the historic opportunity to establish a level of material civilization that will be truly universal. . . .

A Trade Fair of Atomic Industry will be held in the Coliseum in New York, N. Y.,
October 28-31, 1957.

American policy: power or peace?

What then should our policy be? What kind of program should it inspire, right now? It seems to me that there are two alternatives and that the choice between them depends on your conception of American "national interest." Briefly, is the dominant American interest simply power, or is it peace?

An industrialized nation can regard atomic energy merely as a fortunate means for maintaining and expanding its existent industrial complex and thus consolidating or increasing its power position in the world. This, in great part, seems to be the attitude assumed by Great Britain. A heavy investment in atomic industrial power offers her the means of maintaining her status as a first-class industrial and commercial world power. . . .

In contrast, no immediate emergency exists in the United States. Enormous as our power needs are, they can still be satisfied by the use of conventional fuels. Moreover, nuclear technology has not yet reached the point where it can put electric power on the lines in competition with power from conventional generators. Hence, if the national self-interest is narrowly identified with the supply of America's own power needs, there is no compelling incentive to embark on a large-scale nuclear power program.

AEC program inadequate

Our present program is inadequate. There is only one large reactor from which power may be expected before 1961. For the rest, the Atomic Energy Commission's activities in this country are confined to research and development, to the construction of small pilot plants, and to the granting of limited assistance to utility groups. The responsibility for setting the pace of large reactor development is left to private industry. Under the limitations imposed by the large costs and risks involved, private industry is doing all it can. The international aspect of the program consists in the negotiation of bilateral agreements with other countries concerning the exchange of technological information, partial financial assistance for research reactors and provision of nuclear materials for scientific research and for reactor construction.

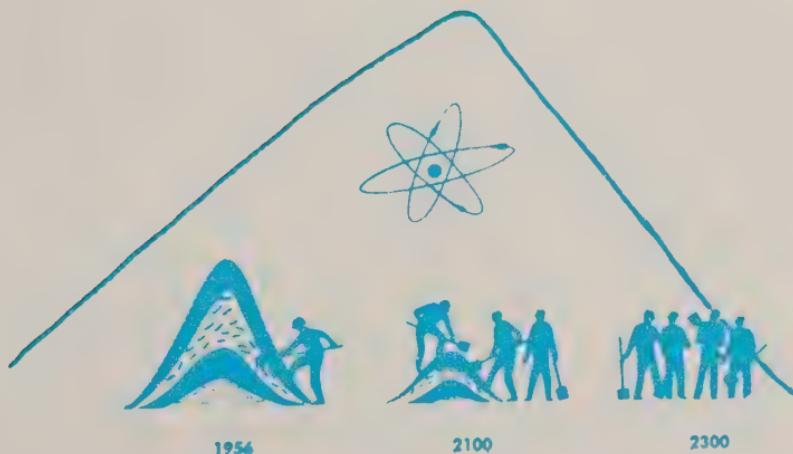
For my part, I think that this program is much too limited.

It falls woefully short of the demands of the current world situation. Moreover, I cannot accept the narrow view of the national self-interest which presently commands our policies. In my view, our national interest is basically identified not with power on the national scene but with peace on the international scene. At the moment it is difficult for me to see that we have developed an "atoms for peace" program that will realize the great human promise in this phrase.

An effective policy, one that will make the phrase a reality, must find its first premise in the conviction that the international atomic-power economy, which has now begun to develop, offers a firm hope of peace. This is true in two senses. It will help to create among the nations an order of interdependent economic life; it will unite them in pursuit of the new international common good which I have briefly described. . . .

continued on next page

OUR RESOURCES OF FUEL



. . . All of the known coal, oil, wood, peat, and other economic fuel sources of energy . . . [can] last only to the year 2300. . . . In the atom is enough potential energy to allow man not only to solve current shortages, but also to allow him to plan for a world in which more people will have more energy than ever before.

—*The New Atomic Age, UNITED NATIONS*

A sound U.S. policy

If American self-interest is to be identified with the cause of peace through world-wide industrial development, it requires that we immediately take up the task of giving solid substance to the present international movement toward the utilization of atomic power for industrial purposes. This task is ours; only we can do it. Without us, the whole movement will stall. Or, if it moves, it may move in directions that we shall regret.

There is only one way of giving solid substance to the movement, and that is by putting industrial reactors into operation as soon as possible and as widely as possible. This in turn means that we must ourselves immediately undertake the construction of two or three large power reactors of different types in what would be the first phase of an accelerated construction program. . . .

This construction program will not look to the satisfaction of America's own present power requirements. Its essential purpose looks beyond any day-by-day demands to a more basic need, namely, to develop an atomic-power industry in America. By this I mean the technological know-how and manufacturing capacity that will be the source and the strong support of the international movement toward an atomic-power economy, a peaceful economy that will itself undergird a peaceful and prosperous international community. . . .

Development by capitalism

This proposal can and should be carried out without disturbing traditional patterns of American industry. Without initial government assistance an American atomic-power industry cannot be created in time to meet the demands of the present crisis. However, in certain phases of America's newest and biggest business we have already proved that this initial reliance on government need not create any dangers to the American system.

For instance, the uranium ore industry, originally a governmental initiative, is now in the hands of private corporations. The present private-capital investment amounts to well over \$100,000,000; within a few years the annual production will have a market value of several hundred million dollars. This

is the pattern of development that I envisage for the whole American atomic-power industry, as it comes into being. The industry would eventually be private enterprise in the full American sense.

America's opportunity

Today we are accustomed to call the American system "responsible capitalism." The name will be more deservedly bestowed when the American system fully shoulders its new responsibility, which is both economic and moral, for the creation of an international atomic power economy. To the assumption of this responsibility America is summoned by the vision which must guide the American people and their Government in this decisive moment of history—the vision of a strong and confident America using its resources of strength and its sense of moral purpose to lead the nations of the world toward the common goal of public prosperity in a peaceful international order.

FRANCES KINGHORN CHALMERS

1901 - 1957

Mrs. Allan Knight Chalmers passed away peacefully on July 21 in Bath, England, where she and her husband were visiting. She was a member of the Council for Social Action, Class of 1960. The Reverend Galen R. Weaver offered the following prayer in her memory at the Christian Social Action Institute, Framingham, Massachusetts:

Our Father, we offer thee praise for the gracious and gentle life of Frances Chalmers and for the firm conviction about human brotherhood which guided her selfless efforts for justice. So remind us of the beliefs and hopes which inspired her life that we too may become channels for fuller life for the multitudes who are disadvantaged. Help us during this week to offer our tribute to her by earnest and faithful attention to our opportunity in being together in this place where she has often come to share her insights and good-will.

May thy peace be with us all in the exigencies and opportunities of life, through Jesus Christ our Lord. Amen.

the biological effects

Whenever atomic energy is released, there are released with it certain invisible but powerful radiations. It has been known for many years that when these radiations strike living things they cause important changes that are often harmful. It is also known that the changes may not be limited to the plant or animal which receives the radiation, but may be passed on to succeeding generations. However, the details of the action, how much radiation will produce a given result, how much can be done to counteract the deleterious effects, these are largely unsolved problems.

There has always been some radiation in the environment. Radium and other radioactive elements in the ground together with cosmic rays from outer space produce a natural "background" over all parts of the earth. However, as atomic activity is stepped up throughout the world, the amount of radiation in our surroundings may be substantially increased. This could have profound effects on all forms of life. But there has been disturbingly little information about just what the effects may be. . . .

Purpose of the report

The present report summarizes the findings to date. It is intended for the lay reader. . . . The purpose is (1) to tell the citizen what science has learned thus far about the potential effects of atomic radiation on himself and his progeny, and on the race as a whole; (2) to give him such information as scientists can now provide to help him participate more intelligently in making necessary public decisions about atomic energy.

¹ Social Action is deeply grateful to the National Academy of Sciences—National Research Council for permission to reprint parts one and two of the report of its Committee on Genetic Effects of Atomic Radiation. A copy of the forty-page report is available at no cost from the publications office, 2101 Constitution Avenue, Washington 25, D. C.

of atomic radiation

It should be emphasized that he will find here only scientific data. Most of the decisions he will be faced with involve ethical, political, economic or military questions as well. These can be more usefully debated, however, against an adequate technical background.

Behind any discussion of radiation must necessarily loom the specter of full-scale atomic war. That a single thermo-nuclear weapon can cause severe radiation damage hundreds of miles beyond its area of immediate devastation is all too well known. That enough such weapons exploded in an all-out war might render the entire earth, or large parts of it uninhabitable, is at least conceivable.

The actual results would depend on the number, the types and the location of the explosions that actually took place. There has been comparatively little attempt in the study thus far to estimate the possible courses of atomic warfare or to assess the biological consequences. The present emphasis has been on peaceful development.

It may be pointed out, however, that so far as radiation is concerned the two aspects are not entirely unrelated. In the first place, when a world-wide atomic power industry becomes fully developed, its accumulated waste products might represent more radiation than would be released in an atomic war. Of course, this radiation will be imprisoned, not broadcast. But the point underscores the magnitude of the coming problem.

Secondly, it becomes clear in this report that even very low levels of radiation can have serious biological effects. In several instances the size of the effect turns out to depend directly on the amounts of radiation. Thus, many of the disastrous consequences of atomic war are clearly implied in this investigation of peacetime problems.

DIGEST OF FINDINGS

It is generally agreed that, in the peacetime development of atomic energy, man has been lucky. He has been dealing with an enormous new force whose potential effects he has only dimly understood. Thus far, except for some tragic accidents affecting small numbers of people, the biological damage from peacetime activities (including the testing of atomic weapons) has been essentially negligible. Furthermore, it appears that radiation problems, if they are met intelligently and vigilantly, need not stand in the way of the large-scale development of atomic energy. The continuing need for intelligence and vigilance cannot be too strongly emphasized, however.

The problems of radiation fall naturally into two main classes: (1) the effects on human beings; (2) the various ways in which radiation can reach human beings through the environment.

1. Effects on humans

The inheritance mechanism is by far the most sensitive to radiation of any biological system. Any radiation which reaches the reproductive cells causes mutations (changes in the material governing heredity) that are passed on to succeeding generations. Human gene mutations which produce observable effects are believed to be universally harmful. Everyone is subjected to the natural background radiation which causes an unavoidable quantity of so-called spontaneous mutations. Anything that adds radiation to this naturally occurring background rate causes further mutations, and is genetically harmful.

There is no minimum amount of radiation which must be exceeded before mutations occur. Any amount, however small, that reaches the reproductive cells can cause a correspondingly small number of mutations. The more radiation, the more mutations. The harm is cumulative. The genetic damage done by radiation builds up as the radiation is received, and depends on the total accumulated gonad dose received by people from their own conception to the conception of their last child.

So far as individuals are concerned, not all mutant genes or combinations of mutant genes are equally harmful. A few may cause very serious handicaps, many others may produce much smaller harm, or even no apparent damage. But from the point

of view of the total and eventual damage to the entire population, every mutation causes roughly the same amount of harm. This is because mutant genes can only disappear when the inheritance line in which they are carried dies out. In cases of severe and obvious damage this may happen in the first generation; in other cases it may require hundreds of generations. Thus, for the general population, and in the long run, a little radiation to a lot of people is as harmful as a lot of radiation to a few, since the total number of mutant genes can be the same in the two cases.

It is difficult to arrive at a figure showing how much genetic harm radiation can do. One measure is the amount of radiation, above the natural background, which would produce as many mutations again as occur spontaneously. It is estimated that this amount is 30 to 80 roentgens. (The roentgen is a unit of radiation. To give an idea of its value, the average dental X-ray delivers five roentgens to the patient's jaw, but only five thousandths of a roentgen of stray radiation to more remote parts of the body such as the gonads.) It is also estimated that a dose of 10 roentgens to every person in the United States would cause something on the order of five million mutant genes which would then be a part of the population's inheritance pool. This figure is subject to considerable uncertainty.

At present the U. S. population is exposed to radiation from **a**, the natural background; **b**, medical and dental X-rays; **c**, fall-out from atomic weapons testing. The 30-year dose to the gonads received by the average person from each of these sources is estimated as follows:

- a.** background—about 4.3 roentgens;
- b.** X-rays and fluoroscopy—about 3 roentgens;
- c.** weapons tests—if continued at the rate of the past five years would give a probable 30-year dose of about 0.1 roentgens. This figure may be off by a factor of five, i.e., the possible range is from 0.02 to 0.5 roentgens. If tests were conducted at the rate of the two most active years (1953 and 1955) the 30-year dose would be about twice as great as that just stated.

If the exposure of the general population to radiation is limited to levels which the genetics committee believes reasonable, there should be practically no pathological effects in the persons receiving the radiation.

Larger exposures (say 100 roentgens and up) of the whole body or a large part of it are generally harmful when received in a single dose. (Much higher doses may, however, be safely and usefully delivered to limited portions of the body under the controlled conditions of medical treatment.) Very little is now known about how to treat the pathological effects of radiation or how to protect the body against them in the first place. Much research is needed in these fields.

One of the effects is a shortening of life. This seems to involve some generalized action. Irradiated individuals may age faster than normally even if they do not develop specific radiation-induced diseases like leukemia. It has not been shown that exposures small enough to be genetically tolerable have this effect. Furthermore, the permissible exposure levels that have been established for persons working with radiation appear to be within the limits of safety. However, it is not yet known what minimum dose, if any, would be necessary to produce a statistically noticeable reduction of life span when very large numbers of people are concerned.

2. Environment and food supply

Radiation in the general environment has not yet become a serious problem. In a few decades, however, radioactive waste products from atomic power plants will represent an enormous potential source of contamination. How much of this radioactivity will actually reach the population depends on how successfully it can be kept out of the great network—ocean and air currents, food and water supplies—which connects man to his surroundings. At present test explosions of atomic weapons are the only significant source of radiation in the general environment, above the natural background.

Meteorologists have found no evidence that atomic explosions have changed the weather or climate. Nor do they believe that continued weapons tests, at the same rate and in the same areas as in the past, would have such an effect.

Radiation from explosions passes into the atmosphere and much of it eventually returns to the ground as fall-out. Fall-out divides into three classes: (1) close-in—material that comes down within a few hundred miles of the explosion and within 10 to 20 hours, (2) intermediate—material that descends in a

few weeks after the explosion, (3) delayed—material that remains in the air for months or years. Close-in fall-out from test explosions affects only restricted, uninhabited regions.

Intermediate fall-out would descend very slowly if it were pulled down only by gravity. It is mostly washed out of the air by rain and snow. It spreads over large parts of the earth, but its effect over a small area may be accentuated if there is heavy precipitation while the radioactive cloud is overhead.

Delayed fall-out is stored for long periods in the stratosphere. Meteorologists know very little about the interchange of air between the stratosphere and lower layers, so they cannot predict exactly how long the material will stay up, or where it is likely to descend.

At this point the oceans are not receiving any significant quantities of radioactive material. But eventually they will undoubtedly be used as a repository for some of the radioactive waste products of atomic power plants. Before this can safely begin on a large scale, much research is needed to determine the mixing rates between various parts of the seas. Materials deposited in some of the deep parts of the ocean may remain there 100 years or more, so that most of their radioactivity would be gone before they reach the surface water. On the other hand, material dumped into coastal and other surface waters would directly affect marine life and, within a few years, would contaminate all parts of the world because of the relatively rapid circulation of surface layers.

Radioactive tracers can be used to chart ocean and air currents and to study the interrelationships of marine animals. Many important experiments in these fields will be possible only within the next 10 or 20 years. Increasing radioactive contamination of the sea and atmosphere will make it impossible after that to detect the tracers against the heightened background.

Radiation from fall-out inevitably contaminates man's food supply. Radioactive elements in the soil are taken up and concentrated by plants. The plants may be eaten by humans, or by animals which in turn serve as human food. At present the contamination is negligible. But the maximum tolerable level is not known. There is not nearly enough information about the

long-term biological effects on man or animals from eating radiation-contaminated food. Research in this area is urgently needed.

Probably the most important potential food contaminant is strontium 90—a radioactive element that concentrates in bone tissue. Already, detectable although biologically insignificant traces of it have turned up in milk supplies thousands of miles from the site of atomic explosions.

Food from the oceans is also subject to radioactive contamination. Marine plants and animals extract and concentrate various radioactive elements that get into sea water. The concentration is cumulative, increasing as it proceeds up the chain from microscopic plankton to edible fish.

Properly used, radiation can enhance man's food supply rather than damage it. Radiation techniques have already opened important new fields in agricultural research and will undoubtedly become increasingly valuable. No drastic change in agricultural production appears imminent, however. Tracer studies will help us understand basic metabolic processes in plants and animals. They will also be applied to practical problems such as the use of fertilizers.

Mutation rates in plants are being artificially speeded up with radiation in the hope of producing new and superior strains. Thus far, only a few new economic varieties have been found, but the method is promising. The use of radiation to sterilize packaged food may have dramatic impact on food technology by reducing the need for refrigeration and extending the shelf-life of many products.

Holding radiation to a tolerable worldwide level will require adequate methods for disposing of, or, rather, for containing radioactive wastes from power reactors. Some of these wastes will remain dangerously radioactive for centuries. Research has indicated some apparently feasible systems for controlled disposal, but none is yet at the point of economic operating reality. The major problem in routine disposal is what to do with the wastes resulting from the processing of reactor fuel. The wastes from normal operations of reactors themselves can be more easily handled. . . .

The Executive Committee of the World Council of Churches meeting in New Haven on August 5, 1957, called upon Christians to urge their governments to abolish war, to control armaments, to establish conditions for peace and to forego the testing of atomic bombs.



a message from the WCC

The Central Committee expresses its gratitude to the Commission of the Churches on International Affairs for the Statement on *Atomic Tests and Disarmament*¹ and desires for it the widest distribution. . . .

Threat to the unborn

Within the last year, public apprehension has grown as to the effects of nuclear tests, and there have been intensified warnings from responsible groups of scientists. In particular, the fact that these tests contain a threat to generations yet unborn rouses us to a more acute awareness than ever of the moral responsibility which must be upon the conscience of the present generation.

We recognize that the question of stopping the testing of nuclear weapons has to be considered in the wide context which is set out in the CCIA Statement. We agree that it is not possible to deal with one part of the inter-related disarmament problem without risks.

There are, however, certain moral principles affecting the whole issue of atomic warfare which we desire to emphasize. The Central Committee reaffirms the conviction expressed at its Toronto meeting in 1950 that "such methods of modern warfare as the use of atomic and bacteriological weapons and obliteration bombing involve force and destruction of life on so terrible a scale as to imperil the very basis on which law and

¹ Available from the Commission of the Churches on International Affairs, 297 Fourth Avenue, New York 10, N. Y. 5 cents.

civilization can exist." The condemnation of such methods finds broad support in the fact that total war, in the sense of warfare without any limitation in the methods employed, is universally in conflict with the conscience of mankind. We also believe that the use of such methods of warfare inevitably involves spiritual degradation for any nation that uses them.

Question the right to jeopardize health of all

We are bound to ask whether any nation is justified in continuing the testing of nuclear weapons while the magnitude of the dangers is so little known and while effective means of protection against these dangers are lacking. We must ask further whether any nation is justified in deciding on its own responsibility to conduct such tests, when the people of other nations in all parts of the world who have not agreed may have to bear the consequences. Therefore, we call upon each nation conducting tests to give full recognition to this moral responsibility as well as to considerations of national defense and international security.

Nothing less than the abolition of war itself should be the goal of the nations and their leaders and of all citizens. The attainment of this goal constitutes a solemn challenge to our particular generation. We welcome and support every honest effort now being made to limit and control armaments of all kinds and to establish conditions for a secure peace. We repeat the Evanston appeal for prohibition of all weapons of mass destruction, including atomic and hydrogen bombs, with provision for international inspection and control.

Forego testing nuclear bombs

We know that a comprehensive program for disarmament must proceed by stages and we realize how much depends upon the deepening of confidence between the nations. But we urge that as a first step governments conducting tests should forego them, at least for a trial period, either together, or individually in the hope that the others will do the same, a new confidence be born, and foundations be laid for reliable agreements.

We therefore appeal to all our brethren to act with Christian courage, and to pray to Almighty God to guide the peoples and their governments aright.



visit to the Soviet Union

Members of the 1957 European Seminar of the Council for Christian Social Action visited England, Germany, France, Holland, Sweden, Finland, and spent ten days in the Soviet Union.

Marriage performed by the state

We visited a marriage bureau in Moscow in an attractively furnished room in a government building. A gracious middle-aged woman sat at a desk, interrogating a young couple and filling out many forms. After completing the forms, the older woman presented the bride with an attractively bound marriage certificate. The service was performed reverently and soberly, if not in the fear of God.

All marriages in Russia are performed by the state. Application for marriage must be made from three to ten days in advance, but no health certificates are required. After the civil service, a couple may be married by the church.

The woman at the marriage bureau showed genuine interest in how things were done in the U.S.A. When she was told that most weddings are performed with religious meaning she grew pensive and asked, "To whom do you pray—to Christ?" The ministers of our group waited for each other to reply. So a Director of Religious Education said: "We pray to God the Father of all people everywhere."

Visit to a collective farm

We were eager to visit a collective farm, but this is not a regular event provided for foreign visitors. However, arrangements were made to visit a farm about twenty-five miles from Moscow. We noted that most of the houses were made of logs and trimmed with ornamental colored shutters. Log houses which have been the rule in cities as well as on farms in that part of Russia are now being replaced in cities by six-story apartment buildings.

The chairman of the board of directors of the collective farm said that six hundred workers live on this farm of about 1,300 acres. Sixty per cent of them work on the farm, while the others

commute by train to Moscow. About eighty per cent of the farm workers and six of the nine members of the board of directors are women.

Encounter with students

Are Russians free to voice their opinions to one another and to visitors? One evening we were about to cross a street in Moscow when several students heard our conversation and asked if we were Americans. We began to talk about life in Russia and Russian-American relations. When a crowd gathered about us, a traffic policeman pushed the people back on the sidewalk, but did not stop the discussion.

When we asked the students about the down-grading of Molotov and Malenkov, they replied that their leaders shifted too rapidly for them to keep up with the changes. To a question about the identity of a party leader with a beard, whom we had seen at the ballet, a student replied facetiously, "I don't know. Perhaps he was Santa Claus." The students seemed like college students in other countries—bantering, jovial, eager for new experience.

In many respects, students are the favored class in Russia today. They receive free tuition and assistance for room, board, and incidental expenses. They study in the finest buildings of Moscow and their professors are highly paid. Many of them study engineering and technical subjects and others, liberal arts. One wonders whether the seeds of free inquiry, planted in young minds, may not some day bear a rich harvest of liberalized opinion. Perhaps education is the leaven which will help to raise the collectivist lump.

Church life

There is only one Baptist church in Moscow, but it holds five two-hour services a week, all of which are crowded. On the Sunday morning we were there the people demonstrated their friendship for the "visiting Americans." Tears streamed down their faces as they pressed our hands. Some put their hands on their hearts, pointed to heaven, and then to us as if to say: "God bless us and bless you!" Those who could speak a little English said again and again: "We want peace, we want peace."

RAY GIBBONS



*For Use on World Order Sunday or Other Occasion
Celebrating Our Christian World Responsibility*

Scripture

Psalm 33:10-22

This nation under God

Amos 9:5-15

God and the nations

Micah 4

Justice, law and peace

Isaiah 11:1-9

The peace of God

Luke 12:13-31

The peril of abundance

Luke 12:48b

*National privilege means
obligation*

Romans 12

The way of reconciliation

Hymns

Father Eternal, Ruler of Creation

O God of Earth and Altar

The Prince of Peace His Banner Spreads

Turn Back, O Man

Prayers

O God, who hast made of one blood all the nations of the earth, and hast set the bounds of their habitation that they might seek after thee and find thee; mercifully hear our supplications, and remove from us the menace of war. Guide the

rulers with thy counsel and restrain the passions of the people, so that bloodshed may be averted and peace be preserved. And, by the pouring forth of thy Spirit upon all flesh, quicken the sense of our common brotherhood, bind the nations into a new bond of fellowship, and hasten the time when the kingdoms of this world shall become the kingdom of our Lord and Savior Jesus Christ. Amen.

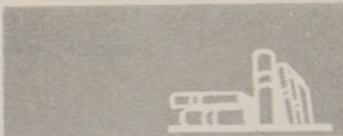
—Divine Service

+++

Eternal God, in whose perfect kingdom no sword is drawn but the sword of righteousness, and no strength known but the strength of love; so guide and inspire, we pray thee, the work of all who seek thy kingdom at home and abroad, that all peoples may seek and find their security, not in force of arms, but in the perfect love that casteth out fear, and in the fellowship revealed to us by thy Son, Jesus Christ our Lord. Amen.

—Book of Common Order of
the Church of Scotland

HUBER F. KLEMME



EFFECTS OF ATOMIC WARFARE

On the Beach, by Nevil Shute.
New York: William Morrow and Company, 1957, 320 pp.
\$3.95.

This provocative novel describes the last nine months of human life on earth. The story takes place in Australia in 1961. A full-scale atomic war has ended all life north of the equator. As surely as autumn follows summer, radioactive fall-out is drifting southward. Dwight Towers, captain of the last navigable ship of the U. S. Navy, an atom-powered submarine, leaves Melbourne for two exploratory cruises to learn as much as possible about conditions in the north. Since everything is "hot" with radioactivity, little more is learned than can be seen from the periscope of the submarine. Dwight Towers and his Australian friends lead fairly normal lives as they await the days when they too will succumb to radiation sickness. The last war was started by two small nations, but the Soviet Union, China and the U.S.A. soon entered it. Although *On the Beach* is written in a matter-of-fact

manner, its impact on the reader is devastating. It describes all too accurately how human life on earth could come to an end.

The Effects of Nuclear Weapons,
Samuel Glasstone, Editor.
Washington: U. S. Government Printing Office, 1957, 580 pp. \$2.

Prepared by the Department of Defense and published by the Atomic Energy Commission, this book describes the effects of current nuclear weapons. Information is based on the wartime bombings of Japan and on tests carried out in Nevada and in the Pacific. While it is intended for "use in planning against possible nuclear attack" it gives the layman an all too clear picture of the horror of atomic warfare. If our civilization survives, future generations will wonder how we can know so accurately the effects of nuclear bombs and yet continue to make them.

The Biological Effects of Atomic Radiation, a Report to the Public, National Academy of Sciences—National Research Council, Washington, D. C., 40 pp., 1956, free. (See pp. 18 to 24.)

PEACEFUL USES OF ATOMIC ENERGY

Atoms for Peace, by David O. Woodbury. New York: Dodd, Mead and Company, 1947, 271 pp. \$2.95.

A popularly written summary of the discovery, development, and present and future peaceful uses of atomic energy in the U.S.A. and in underdeveloped countries.

The Peaceful Atom on Long Island, the May, 1957, issue of LONG ISLAND BUSINESS, Hofstra College, 1000 Fulton Avenue, Hempstead, N. Y., 40 pp. \$1.

Anyone who thinks the Atomic Age is in the future will be amazed to discover its present reality on Long Island: the Brookhaven National Laboratory for nuclear research; private nuclear engineering services; the production of atomic fuel; and the use of radioisotopes in dairy research and in medicine.

The International Atomic Energy Agency, U. S. Department of State publication 6477, U. S. Government Printing Office, Washington 25, D. C., 12 pp., 1957. 15¢.

An introduction to the atoms-for-peace program suggested by President Eisenhower and a description of the new UN agency set up to further it.

The New Atomic Age, a United Nations publication, 1956. 40 pp. 25¢, from International Documents Service, Columbia University Press, New York 27, N. Y.

This brief, well-written, attractively illustrated booklet provides an excellent introduction to atomic energy and what it can do for man. It describes the eventual exhaustion of conventional fuels: coal, oil, wood and peat; and indicates how atomic energy can supply our need for power. It explains nuclear radiation and describes its uses: (1) as a measuring tool in science, industry, agriculture and medicine; and (2) to produce changes with radiation, e.g., to prevent spoilage in foods; and to kill cancerous growths. It describes the role of the International Atomic Energy Agency and the contributions of other branches of the UN.

Britain Leads in This Atomic Age, British Information Service, 45 Rockefeller Plaza, New York 20, N. Y., 1957, free.

A description of the nuclear program which is designed to supply half of Britain's need for electric power by 1970.

MAGAZINE

Bulletin of the Atomic Scientists, a magazine of science and public affairs, 5734 University Avenue, Chicago 37, Ill. \$5 per year. FERN BABCOCK

Coming Events

OCTOBER 14-16, 1957

Eleventh World Order and United Nations Seminar, New York, N. Y. Director, Rev. Herman F. Reissig.

OCTOBER 29-31, 1957

Meeting of the Council for Christian Social Action, United Church of Christ, Cleveland, Ohio.

JANUARY 6-16, 1958

Study Tour of Puerto Rico. Departure from Idlewild Airport, New York, N. Y. Director, Rev. Galen R. Weaver.

FEBRUARY 4-7, 1958

Churchmen's Washington Seminar, Washington, D. C. Sponsored by the CCSA and 17 similar denominational groups.

FEBRUARY 11-13, 1958

Southern Christian Social Action Institute, Lake Byrd Lodge, Avon Park, Florida. Registrar, Rev. Robbins Ralph.

APRIL 15-17, 1958

Washington Seminar, Washington, D. C. Sponsored by the CCSA. Director, Fern Babcock.

For more information write the Council for Christian Social Action, 289 Fourth Avenue, New York 10, N. Y., OR 2969 West 25th Street, Cleveland 13, Ohio.

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Berkeley 9, Calif.

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